REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicants thank the Examiner for carefully reviewing this application.

Disposition of Claims

Claims 1-26 and 33-39 are pending in the application. Claims 1, 2, 5-11, 16-19, 21, 22, 26 and 33 are independent. The remaining claims depend, directly or indirectly, from claims 2, 3, 9-11, 17-19, and 22.

Claim Amendment

Claim 1 has been amended to correct a typographic error. No new matter has been introduced and no new search is believed to be required.

Rejection(s) under 35 U.S.C § 103

Claims 1-26 and 33-39 stand rejected under 35 USC § 103(a) as being unpatentable over Monson et al. (U.S. Patent No. 5,887,491) in view of Hauwiller et al. (U.S. Patent No. 6,606,542). This rejection is respectfully traversed.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, *the prior art reference (or references when combined) must teach or suggest all the claim limitations.* (M.P.E.P. § 2143). The examiner bears the initial burden of *factually supporting* any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness. (M.P.E.P. § 2142). Impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art. (M.P.E.P. § 2142).

The present invention relates to apparatus and methods for measuring soil properties, in which *soil types and water contents of the measurement sites are used as higher-level parameters to determine data acquisition conditions and/or to select appropriate soil models for data*

analysis. (Specification, p. 5, lines 5-14). Some embodiments of the invention may use the water content and soil type information from a database or from previous measurements. Other embodiments of the invention may use a *soil measurement assisting device* to obtain preliminary measurements for deriving the water content and soil type information, before performing full scale measurements. (Specification, p. 8, line 18 – p. 9, line 3). Prior art apparatus do not use soil measurement assisting devices to provide information related to soil types and water contents for further data acquisition or for model selection.

All independent claims recite embodiments related to the hierarchical (higher-level) use of the soil type and the water content parameters to determine a proper soil model and/or to determine measurement conditions for further measurements.

Claim 1

Claim 1 includes the following limitations: (i) obtaining information related a soil type and a water content of a measurement site; (ii) *determining a model based on the soil type and the water content*; (iii) acquiring measurement data using a soil sensor based on information related to at least one parameter selected from the soil type and the water content; and (iv) calculating the properties of the soil using said acquired measurement data in the model.

Other Independent Claims

Independent claims 2 and 5-11 each include one or both of the following limitations: (i) *determining measurement conditions . . . based on . . . the soil type and the water content*; and (iii) *determining a model . . . based on . . . the soil type and the water content.*

Independent claim 16 recites a *soil measurement assisting method* in which a first set of (preliminary) measurement data is used to determine a preliminary soil model. Then, a second set of measurement data is obtained and used to modify the preliminary soil model. This soil measurement assisting method uses two-stage measurement data in a hierarchical manner to determine a model for deriving soil properties.

Independent claims 17-19 each relate to a *soil measurement assisting program*, in which "a process that acquires initial measurement data related to a soil type and a water content of a measurement site." In addition, each of these claims includes a limitation that such initial measurement data are used to determine a soil model or measurement conditions for acquiring

further measurement data to be inputted into a model for calculating soil properties.

Independent claim 21 relates to a soil measuring apparatus that includes *a soil measurement assisting device* that determines . . . a soil type of the measurement site, a model for carrying out processing, and measurement conditions for acquiring further measurement data.

Independent claims 22 and 26 relate to a recording medium storing information that includes "a soil type, information related to a water content of a soil, a model for calculating soil properties, and soil measurement data correlated with measurement conditions to be imputed into the model." The information related to the soil types and the water contents are stored at the same level as the models, rather than as a parameter inside a soil model, so that the water content and soil type information may be used to determine a suitable soil model.

Independent claim 33 relates to a soil model database control system, "wherein the soil model database stores one parameter selected from a soil type, information related to water contents of a soil, soil measurement data for calculating soil properties, and soil correlation information." Again, the information related to soil types and the water contents is treated as higher level parameters.

In contrast, Monson et al. discloses a conventional soil analysis system for determining various soil characteristics. As noted by the Examiner, Monson et al. discloses various reflectance testing assemblies for the purpose of analyzing moisture content, organic matter content as well as mineral composition of a soil sample. (Office Action, p. 8, first paragraph). Like other prior art systems, Monson et al. teaches that moisture content is but one parameter to be determined together with other parameters (e.g., organic matter content, nitrogen, phosphate, potassium, and other elements); it does not use the water content and soil type information as higher-level parameters to determine the data acquisition conditions and/or to select a proper soil model.

Although Monson et al. also discloses that "soil moisture data may be used to factor in moisture content for the reflectance data to isolate the influence of moisture content on the reflectance data to isolate the organic matter content," (Office Action, p. 8, last paragraph), the water content (after it is derived from the data together with organic matter and mineral compositions) is used as a factor for error correction (adjustment) in order to improve the accuracy of the organic matter and mineral compositions. Monson et al. does not teach or suggest the use of water content (let alone the use of water content *and soil type*) to select data acquisition conditions

and/or soil model.

The Examiner repeatedly cites several paragraphs from Monson et al. in all Office Actions to reject the claims. However, the Examiner did not specifically point out, as required by M.P.E.P. § 2142, nor could the Applicant find, which parts of these paragraphs provide support for the teaching of using the *water content and soil type to select data acquisition conditions and/or soil model.* Furthermore, these paragraphs do not provide any teaching or suggestion of a measurement assisting device or method as recited in claims 17-19.

Hauwiller et al. discloses a system for creating application maps for controlled dispensing apparatus based upon field data. (Abstract). Hauwiller et al. does not teach or suggest what is missing in Monson et al. A combination of Monson et al. and Hauwiller et al. cannot render claims of the invention obvious.

The Examiner cites Hauwiller et al. as providing mathematical modeling techniques and motivations to combine with Monson et al. The Examiner reasons that a combination of the mathematical modeling techniques of Hauwiller et al. with the "on-the-go" soil collection and analyzer of Monson et al. allows for proper fertilizer application by considering and compensating for the influence of moisture content on measured soil conditions, and ultimately on the overall calculated soil profile, to produce a better yield of crops and more profitability to the landowner. (Office Action, p.8, paragraph 8; p. 11, paragraph 11). First, this does not provide any support that a combination of these two references would teach or suggest the use of *water content and soil type as higher level parameters to determine data acquisition conditions and/or to select a soil model*, nor does this provide any teaching or suggestion of a soil measurement assisting device or method. More importantly, the mathematical techniques of Hauwiller et al. are for modeling the relationship existing between the field conditions and the desired crop output. (Col. 9, lines 35-40). Hauwiller et al. does not teach a soil model, selected based on water contents and soil types, for the derivation of soil properties (e.g., inorganic and organic matter contents) from measurement data.

Because the Examiner has not provided factual support from the cited prior art references for every limitation of the claims, the requirements for prima facie obviousness rejections have not been met. (M.P.E.P. §§ 2142 and 2143). If the Examiner is relying on facts within the personal knowledge for the missing teaching in the cited prior art references, Applicants respectfully request that the Examiner provide an affidavit pursuant to 37 C.F.R. § 1.104(d)(2).

For the reasons set forth above, Monson et al. and Hauwiller et al., whether considered separately or in combination, cannot render obvious the invention cited in independent claims 1, 2, 5-11, 16-19, 21, 22, and 33. Therefore, these independent claims are patentable over these prior art references, and the dependent claims are patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 04730.003001)

Respectfully submitted,

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